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THE HISTORY OF ARGON AND HELIUM.

By Alfred R. L. Dohme, Ph.D.

Toward the close of the year 1894 Lord Rayleigh, professor of physics at the University of Cambridge, and secretary of the Royal Society of London, published a paper[1] in the Proceedings of the Royal Society, in which he described some anomalies encountered in determinations of the density of nitrogen gas. Lord Rayleigh communicated his curious experiences to Prof. William Ramsay, professor of chemistry, University College, London, and together they undertook to solve the intricate and intensely interesting problem. On January 31, 1895, they read a paper before the Royal Society, entitled, "Argon, a New Constituent of the Atmosphere," and the result was that the scientific world in particular, as well as the world in general, were set on edge, unbalanced as it were, and neither have yet fully recovered their equilibrium. To think that for more than a century people had been daily breathing, handling, testing, analyzing and discussing the all-pervading atmosphere of our planet, and had not, until the year 1894, discovered that it contained something besides oxygen, nitrogen, carbon dioxide, water vapor and nitrous acid was touching that world in a very tender spot, and it felt hurt. Facts are facts, however, and never respect feelings. We may very properly consider the discovery of these English scientists as epoch-making, because, as we shall see, they introduce into the science of chemistry something that is entirely new to it. Lord Rayleigh had

[1] Rayleigh, "On an anomaly encountered in determinations of the density of nitrogen gas." Proc. Roy. Soc., 55, 340 (1894).

found that nitrogen extracted from chemical compounds is about 0·5 per cent. lighter than atmospheric nitrogen. With Professor Ramsay he then made nitrogen in six different ways, and determined the density of each kind of nitrogen. Let us, for convenience, call this nitrogen obtained from chemical substances, "chemical nitrogen" to distinguish it from "atmospheric nitrogen," as this term had been understood prior to the autumn of 1894.

The chemical nitrogen was obtained:

(1) From nitrous oxide, and gave a density of . . . . . 2·2990
(2) From nitric oxide, and gave a density of . . . . . 2·3001
(3) From ammonium nitrite purified at a red heat, and gave a density of . . . . . 2·2987
(4) From ammonium nitrite purified in the cold, and gave a density of . . . . . 2·2987
(5) From urea by means of sodium hypobromite, and gave a density of . . . . . 2·2985
(6) From air by means of hot magnesium and subsequent liberation as ammonia and conversion into nitrogen by means of calcium hypochlorite, and gave a density of . . . . . 2·29918

The mean of all these densities is 2·2990, which is hence the density of chemical nitrogen, while, as a mean of three experiments, the density of atmospheric nitrogen was found to be 2·3102.

The difference was naturally at first attributed to impurities, but none such in form of a lighter gas could be found in the chemical nitrogen. The next explanation was that some of the nitrogen molecules of the chemical nitrogen had been split up into atoms. Both kinds of nitrogen were then tested in this particular by subjecting them to the silent electrical discharge, and both were found to retain their volume unaltered, thus dispelling the possibility of this explanation. There remained, then, only as the explanation of the discrepancy in weight, the fact that one of the gases was a mixture of several gases. To assume that chemical nitrogen was a mixture was contrary to experience and to Stas' work. Hence the hypothesis was made that atmospheric nitrogen contains something else than nitrogen. The identification of "phlogisticated air" with the constituent of nitric acid is due to Cavendish, whose method consisted in operating with electric sparks upon a short column of gas confined with potash over mercury at the upper end of an inverted U tube[1]. The repetition of Cavendish's experiments

[1] Cavendish—Experiments on Air; Phil. Trans., 75, 372 (1785).

only served to increase the admiration with which this great investigator is generally regarded. Cavendish, after repeatedly sparking this "phlogisticated air," *i. e.*, nitrogen with oxygen, found that some always remained that could not be converted into nitric acid, and that it constituted about $\frac{1}{120}$ part of the whole. Whether he regarded this gas as an impurity or as nitrogen cannot be determined, but it is more than likely that what he had in the top of his inverted U tube was what we now call argon. Cavendish's experiments were repeated, and it was found that the amount of his unsparkable gas was proportional to the amount of air operated upon. A sufficient quantity was made to determine its spectrum, and it was found that it did not give the spectrum of nitrogen, but of argon. Next, Rayleigh and Ramsay made argon in quantity from air by removing, one after the other, constituents of the latter; thus moisture by means of phosphorus pentoxide, oxygen by means of sparking with hydrogen, carbon dioxide and nitrous acid by means of caustic alkalies, and, finally, nitrogen by means of red hot magnesium and magnesium vapor. This is a very tedious operation, especially the removing of the last traces of nitrogen. They then proved that chemical nitrogen does not contain more than traces of argon, by treating a large quantity of the former in the same way as they had treated the air. They invariably found argon present, but only to a small fraction of the extent it would have been there if atmospheric nitrogen had been used. Thus, where they would have obtained 30 c.c. of argon if atmospheric nitrogen had been used, they actually only found 3·3 c.c. of argon. This had, of course, been introduced from the air and the water used, and to their minds proves that chemical nitrogen does not contain argon.

PROPERTIES OF ARGON.

The density of argon made by the Cavendish oxygen method was found to be 19·70, H_2, or the hydrogen molecule, being taken as 1; while that of argon made by means of magnesium was found to be 19·90. The spectrum in wave lengths is:

Blue line, wave length	487·91	Strong.
" " " "	476·50	Fairly strong, characteristic triplet of lines.
" " " "	473·53	
" " " "	472·56	
Red line, " "	696·56	Strong.
" " " "	705·64	"

Yellow line, wave length	603·84	Strong.
Green line, " "	561·00	"
And four other green lines.		
Blue-violet line, wave length	470·2	Strong.
Violet line, " "	420·0	"
And five other violet lines, all strong.		

Professor Crookes, who is studying the spectrum of argon, has concluded that this gas possesses, most likely, two spectra, which he thinks he can separate. This would indicate that argon is a mixture of two gases. Argon is about two and one-half times as soluble in water as nitrogen, and possesses, approximately, the same solubility in water as oxygen. We hence find, as we would expect as a result of these determinations, that rain-water contains more argon than nitrogen.

Professor Olszewski, of Cracow, has liquefied argon, and also solidified it by the combined action of extremely high pressure and low temperature upon it. He obtained it in white crystals which melt at —189·6° C. Its critical temperature is —121° C., and its boiling point is —187° C., both of which are lower than the respective constants of oxygen.

By determining the velocity of sound in a gas, we can determine the ratio of the specific heat at constant pressure to that at constant volume. In the case of argon, this ratio was found to be 1·66, which is proper for a gas in which all the energy is translational, *i. e.*, to a gas that is monatomic in its condition. The only other such known gas is that of mercury at high temperatures.

All attempts to induce argon to combine with other elements have proven abortive, and the gas has well-earned its name of "no energy" from the Greek words *a* and *ἔργον*, contracted into *ἄργον*. The amount of argon in the air is, approximately, 1 per cent.

From Avogadro's law we know that the density of a gas is half its molecular weight; and as the density of argon is, approximately, 20, its molecular weight must be 40. But its molecule is identical with its atom; hence, its atomic weight is 40, if it be an element, or the mean of the atomic weights of the gases constituting argon, if argon is a mixture of gases. The spectrum work of Professor Crookes argues that argon is a mixture of gases, while Professor Olszewski's work, showing that it has a definite melting-point, a definite boiling-point, and a definite critical temperature and pressure, and that on compressing it in the presence of its liquid, the pressure remains

constant until all gas has condensed to liquid, strongly indicates, if it does not prove, that argon is an element. Further work alone can prove which view is correct.

HELIUM.

In April, 1895, Professor Ramsay was studying the nature of gases obtained by heating minerals, his object no doubt being to obtain argon in this way. From some minerals he did obtain argon, but from many of them he obtained a very light, colorless gas, that was lighter than argon and gave a different spectrum, and in particular gave a brilliant D_3 line in the yellow, which line had been noticed in the solar spectrum, but had never been obtained from an element on the earth. He named this gas helium, from ἥλιος, the Greek name for the sun. The D_3 yellow line had been observed thirty years before by Lockyer and Frankland, who supposed it to be that of a hypothetical element, which they named helium. Signor Palmieri, in Italy, some years since, obtained a soft substance from some ejected lava of Mt. Vesuvius that gave a yellow spectral line 587·5, the same as the D_3 line, but he gives no details. Dr. Hillebrand, of Washington, D. C., studied some years since, the gases occluded by minerals, in particular uraninites of various localities,[1] but found only nitrogen, as the spectrum of the gas obtained was that of nitrogen, and he obtained nitric oxide on sparking it with oxygen. He sent some of the uraninite to Professor Ramsay, who found that it did contain 10 per cent. of nitrogen, but also helium. The nitrogen masked the helium spectrum considerably, and, as Professor Ramsay says, it is likely that if Dr. Hillebrand had been working with clèveite he would have discovered helium. To extract the helium, five grammes of coarsely powdered mineral are heated in a glass bulb (made of hard glass) which has been exhausted by means of a Töpler pump. Thus are obtained CO_2, H, N, H_2O, and helium. Many rare minerals were examined, and the following yielded more or less helium in the order of their mention: monazite, clèveite, bröggerite, pitchbende, xenotrim, orangeite, samarskite, yttrotantalite, hjelmite, fergusonite, tantalite, polycrase, etc. Professor Ramsay used mainly clèveite and bröggerite, because they were most available. Helium must be mechanically held by the minerals, since any of them, when heated and allowed to cool in helium, do not take up any of the

[1] Bulletin U. S. Geolog. Survey, 78, 43.

latter. The impurities of the resulting gas were removed as follows: CO_2 by potassium hydroxide; water vapor by phosphorus pentoxide; hydrogen by sparking with an excess of oxygen, removing the excess of the latter by means of pyrogallic acid. The nitrogen was removed by repeatedly passing the gases over and through red-hot magnesium and its vapor.

The density of helium as the mean of five determinations was found to be 2·13 (O = 16). The half wave-length of sound in helium was found to be 101·5 mm. and in air 36·04 mm. By the same calculation as was given under argon above, it was found that helium is a monatomic gas. If the density as compared with H_2 is 2·13, and it is monatomic, then its atomic weight is 4·26. It is very slightly soluble in water, one volume absorbing only 0·0073 volume of the gas. This is the lowest solubility ever recorded. It is insoluble in absolute alcohol and in benzene. Its spectrum is made up of several lines in the red, orange-red and yellow. Several lines are identical with argon lines; thus two in the red and one in the orange-red, but the bright red line of argon is faint in case of helium, and the bright red line of helium is faint in case of argon. The characteristic D_3 yellow line of helium is a doublet, one line of which is faint and the other very bright, the distance between them being about one-fiftieth of that between the D_1 and D_2 lines of the solar spectrum.

An analogy exists between argon and helium. Both are very inert and cannot be separated when mixed, on account of their similarity in properties. Their densities and spectra, however, plainly prove their difference. Both are unattacked by oxygen when sparked with it, and both are unattacked by the vapor of magnesium. Both are monatomic and these properties differentiate them from all other elements. A most anomalous property of helium is its refractive index—which is about one-tenth that of hydrogen, a lighter gas—a fact which is as unlooked for as it is inexplicable. Why is argon in the air, and helium not there present, but confined to minerals?

Dr. Johnstone Stoney[1] probably gives the correct answer to this question. He shows that, if hydrogen were present in the atmosphere, it would at once leave this planet by virtue of the velocity of its own molecular motion, and migrate to a planet possessed of suf-

[1] *Chemical News*, 1895, 71, 67.

ficient gravitational attraction, enough mass, to hold it fast. This, he says, accounts for the presence of helium and hydrogen in the chromosphere, and for the absence of an atmosphere and of water vapor on the moon. It would account for the absence of so light a gas as helium in our atmosphere, and for the presence of the helium line in the spectrum of the chromosphere. If an element forms compounds, or is absorbed by solids, it will be found on the earth; hence, we find helium occluded in minerals, while argon, which is so heavy and dense, can be held as such about our planet. Argon occurs in our atmosphere because it is so inert that it does not form any compounds, and nitrogen is there present because it is also inert and rarely enters into combination. Its compounds, too, are mostly decomposed by water, and the excess of nitrogen, hence, is in the air. Oxygen is in the air because there is an excess over what is necessary to oxidize everything on the surface of the earth. If there are gases similar to argon in inertness, and whose density is not less than that of nitrogen, they may too be looked for in the air. The density of argon is too high, and cannot be accounted for by assuming that it is a mixture of A_2 and A_1. As it clearly does not belong where its atomic weight places it in the periodic system, it must needs be a mixture, although its behavior near its critical temperature indicates that it is an element. There is, of course, no place for helium in the periodic system, as it lies between hydrogen and lithium. But we must not forget that there is no place for hydrogen, either, strictly speaking, and it may be that there may be an eighth group series at the beginning of our system, corresponding to the iron, nickel and cobalt, or the osmium, iridium and platinum series. If so, a third gas of atomic weight between hydrogen and lithium is yet to be discovered. It has been mentioned that argon and helium have some spectral lines in common. As no lines of any two elements have ever been found to coincide as yet, we are confronted with the possibility that both these gases contain a common ingredient. The density of helium is, however, already so low that it is difficult to imagine that it contains as an admixture anything much denser; for to possess the density it now has, considered as a mixture, the true helium would have to be possessed of a lower density still; in other words, it would have to be lighter still than it now is. On the other hand, an admixture of helium with argon would tend to make the density of pure argon, and also its atomic weight,

even heavier than it is. Hence, the supposition that they contain a common constituent is not fraught with much semblance of probability. We know that Professor Ramsay, Lord Rayleigh and many others are working at this most marvellously complicated array of phenomena presented by argon and helium, and, until more facts are forthcoming, it is useless to speculate what helium and argon are. *Veritas vos liberabit.*

BALTIMORE, October 7, 1895.

GRANULATED OPIUM.

BY LYMAN F. KEBLER AND CHARLES H. LAWALL.

"We recommend that granulated opium be used in the preparation of tincture and deodorized tincture of opium and that the use of precipitated phosphate of calcium be omitted in their preparation."

The preceding remark is taken from the "Report of Committee on Revision of the U. S. Pharmacopœia," submitted to the American Pharmaceutical Association at their Denver meeting in August.

Granulated opium has been an article of commerce for some few years past, although it never attracted the attention it deserves. The limited number who have become familiar with its use and advantages speak in the highest terms of its superiority over all other forms of the drug for quickly and easily manufacturing the various galenical preparations in which opium is the primary ingredient.

The percolation of finely powdered opium alone, which was authorized by the Pharmacopœia of 1880, and which was found to be impracticable, was supplemented in the last revision of the same work by the addition of 50 per cent. of precipitated calcium phosphate. This addition is a questionable improvement over the former process, leaving much to be desired in both elegance and expedition. The U. S. Dispensatory, 17th edition (p. 1390), refers to the subject as follows: "Precipitated calcium phosphate has been added, and finely powdered opium directed in the U. S. P. 1890 process, because much trouble seems to have been experienced in procuring at all times in the market the coarsely powdered opium which was the only kind suitable for use in the U. S. P. 1880 process."

The coarsely powdered opium, or granulated opium, as it is usually termed, is now easily obtainable and, as its use is constantly

increasing, we may fully expect to see it authorized in the next revision of the U. S. P. In appearance it is extremely characteristic, the opium being in the form of small, irregular fragments of nearly uniform size. No methods for its preparation have as yet been published to the writers' knowledge and it is probable that its manufacture will be conducted by those who are able to handle it in large quantity, as is the case with powdered opium.

The use of granulated opium is characterized by its simplicity and ease of manipulation. The process in general is as follows: Into the lower orifice of a cylindrical percolator place a plug of absorbent cotton, introduce the opium loosely, without previous moistening; then press it down firmly and cover it with a filter paper, held in place by a suitable weight. Any desired menstruum can now be carefully poured on, and after due maceration (which may vary from 4 to 12 hours, according to the desire of the operator) percolation may be allowed to proceed, the rate of outflow being so regulated as to exhaust the drug in the most thorough and speedy manner.

A number of experiments were performed with granulated opium in the preparation of the tincture, duplicate assays being made of each sample of the drug before percolation. Experiments were also made, using the U. S. P. 1890 process, the directions being followed as carefully and uniformly as possible, taking similar precautions in previously assaying the drug in each case. The U. S. P. 1890 process was experimented upon to verify, if possible, the results which were obtained by Professor Francis Hemm, and which were reported by him to the Missouri Pharmaceutical Association.[1]

Professor Hemm used a powdered opium of a well-known make, which, when re-assayed, was found to contain 13 per cent. of morphine. The tincture prepared by him from the above opium, using the U. S. P. 1890 process, contained only 1 per cent. of morphine, and further percolation of the residue failed to extract more than a trace (·02 per cent.) of the missing alkaloid. Professor Hemm, in replying to a letter which was written to him, asking for any further information he might have, stated that, in the discussion which followed the reading of his article, the difficulty was attributed to the

[1] Report on Tr. Opium, by Prof. Francis Hemm, Missouri Pharmaceutical Association, 1895, *National Druggist*, August, 1895, p. 242.

precipitated calcium phosphate in the official process, as it appears to interfere in some unknown manner with the thorough extraction of the morphine from the opium.

The following experiments, performed by the authors of this article, seem to support this theory: 10 grammes of powdered opium were assayed in the usual way, and yielded 14·48 per cent. of morphine; 10 grammes of the same sample were mixed with 5 grammes of precipitated calcium phosphate and exhausted, as in the assay method, using diluted alcohol. The resulting filtrates, which amounted to more than 300 c.c., were assayed by the U. S. P. process for tincture of opium, and yielded 1·317 per cent. of morphine, showing a loss of 1·31 per cent.

The table of comparative results will be found at the close of the article. The experiments, in detail, were as follows:

No. 1.—100 grammes powdered opium, assaying 14·09 per cent., were used in the preparation of 1,000 c.c. of tincture of opium by the U. S. P. 1890 method. The finished preparation assayed 1·2 per cent. morphine, showing a loss of 2·09 per cent.

No. 2.—50 grammes powdered opium, assaying 13·92 per cent., were used as in No. 1. The resulting preparation assayed 1·195 per cent., the loss being slightly less than in the previous instance.

No. 3.—100 grammes granulated opium, assaying 12·15 per cent., were used, and, after placing the drug in the percolator in the manner previously mentioned, 100 c.c. of water were poured on and allowed to macerate for twelve hours. Percolation was then commenced with diluted alcohol, receiving the percolate into 100 c.c. of alcohol, contained in a graduated receiver; ten hours' time was allowed for percolation, and the assay of the tincture, when finished, showed 1·183 per cent. of morphine, a loss of but 0·32 per cent. This tincture deposited considerable sediment (a defect which was not observed in the subsequent cases where diluted alcohol was used in the preliminary maceration). It was filtered after standing one week, and re-assayed with the same results as before.

No. 4.—In this case 100 grammes of the same drug were operated upon and maceration for 4 hours with diluted alcohol was allowed. The percolation consumed but 6 hours in this case, making a total of only 10 hours from the beginning of the process to the end. The result of the assay was practically the same as before, being 1·180 per cent.

No. 5 was conducted similarly to No. 4, percolating for 10 hours, and using granulated opium which assayed 14·35 per cent. morphine. 1·370 per cent. of morphine was obtained in the assay of the completed tincture.

Nos. 6, 7 and 10 were executed in precisely the same manner as No. 5, and gave practically identical results.

In Nos. 8, 9 and 11 the only change made was in retarding the rate of percolation so that it covered 24 hours instead of 10 hours. The assays show a slight increase in the percentage of morphine extracted.

Nos. 12 and 13 were additional experiments with the U. S. P. process, the results being no more encouraging than before.

These experiments were all conducted in the most careful manner, using good quality precipitated calcium phosphate and making duplicate assays in nearly every case. The uniformly low results which were obtained by the official process indicate that the objections which have been offered to it are not without good foundation. The maximum loss by this process was 2·42 per cent., the minimum loss was 1·40 per cent. With the granulated opium process the greatest loss was 0·65 per cent., the least being only 0·15 per cent. A comparison of the two methods with reference to elegance and neatness gives immediate preference to the use of the granulated drug. The strictly followed U. S. P. process is anything but neat, and often involves difficulties which have a tendency to disturb the serenity of the operator's temper.

With regard to the rapidity of percolation the tendency of the granulated opium is to allow the menstruum to pass too rapidly, and it must be retarded somewhat in order to obtain the best results. With the official process the case is far different. No choice whatever is allowed the operator, who must submit to the inevitable and allow it to take its own time. Experiments conducted as uniformly as possible, produced widely different results in this respect, and the length of time required for percolation bears no simple relation to the percentage of morphine extracted, unless it be an inverse ratio, for in the instances when the percolate came through with exasperating slowness the loss of morphine appeared to be the greatest.

Summing up the entire work, it has been shown that a finished preparation of tincture of opium can be made by the granulated opium process in from 10 to 36 hours, with a loss of morphine vary-

ing from 0·3 to 0·6 per cent., which loss can be reduced by lengthening the time of percolation. The U. S. P. process requires from 60 hours to 6 days, with a loss of from 1·4 to 2·42 per cent. of morphine.

While this work was being undertaken inquiries were also made at a number of retail drug stores, in order to ascertain the extent of the use of the official process. Only a small percentage of the persons interrogated follow the process strictly; the majority do not use it at all, preferring to exhaust the drug in a more speedy and thorough manner. Some persons use it with the addition of sand or sawdust to hasten the percolation, in which case the precipitated calcium phosphate might just as well, or better, be omitted; this, however, was not done; the few who use the process expressed themselves, in most cases, as being dissatisfied with it.

The processes of the U. S. P. should in all cases be the best obtainable for their respective preparations. This is not the case with the process for tincture of opium, but it is hoped that a change will be made when the time comes, and we sincerely hope that granulated opium will be the form of drug officially authorized.

TABLE OF COMPARATIVE RESULTS.

Number.	Process Used.	Per Cent. of Morphine in Opium.	Per Cent. of Morphine in Tincture.	Per Cent. of Morphine Lost.	Time Allowed for Maceration.	Time Consumed in Percolation.
1	U. S. P. 1890	14·09	1·200	2·09	—	6 days
2	U. S. P. 1890	13·92	1·195	1·97	—	2 days
3	Granulated opium	12·15	1·183	0·32	12 hours	10 hours
4	Granulated opium	12·15	1·180	0·35	4 hours	6 hours
5	Granulated opium	14·35	1·370	0·65	4 hours	10 hours
6	Granulated opium	14·35	1·370	0·65	12 hours	10 hours
7	Granulated opium	14·35	1·375	0·60	12 hours	10 hours
8	Granulated opium	13·70	1·355	0·15	12 hours	24 hours
9	Granulated opium	14·25	1·390	0·35	12 hours	24 hours
10	Granulated opium	14·35	1·370	0·65	12 hours	10 hours
11	Granulated opium	14·35	1·398	0·37	12 hours	24 hours
12	U. S. P. 1890	13·92	1·252	1·40	—	3 days
13	U. S. P. 1890	14·48	1·206	2·42	—	4 days

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ADDITIONAL NOTES ON BLACK SULPHUR.

By Lyman F. Kebler.

In the May number of this Journal there appeared a few notes on black sulphur. I there invited correspondence for further information. Two very interesting and valuable letters were received from two eminent druggists. The object of this paper is to give the substance of these two communications.

Mr. A. E. Ebert:—"We sell several pounds a year to persons who administer it to domestic animals, being an ingredient, usually, of some private recipe they possess for the treatment of diseases of horses, swine, etc. Some forty years ago, when I first entered the drug business, we purchased black sulphur in quantities of 100 to 500 pounds, and it was much used in domestic practice by Germans, English and other old-country people.

"Originally, black sulphur was powdered crude sulphur or the skimmings or the residue from the purifications of the sulphur of commerce."

Mr. Ebert enclosed a sample of black sulphur from the stock of Ebert's Pharmacy. The composition was as follows: sulphur, 85·82 per cent.; charcoal, 9·28 per cent., and ash, 2·90 per cent.

Mr. Charles A. Heinitsh:—"Black Sulphur, Sulphur Cubillinam, Roszschwefel or Horse Brimstone, is crude or native sulphur. What was generally used years ago was the dark, the black, and the carbonaceous parts as it was mined; also the refuse or residue, after refining the sulphur and making the roll, either alone or with the iron which was found in it or mixed with it: the squamaferri or scaly iron, as it was called.

"The sulphur furnaces gathered and sold it as a by-product. For years my house sold it as a cheap brimstone or sulphur, used in horse and cattle powder, mostly for horse powder, as it was then considered more effectual in curing the scab and other skin diseases, which horses were afflicted with, than the refined. Whether this is so or not I am not able to say, but my father and his predecessors sold large quantities of it."

The information imparted by these two experienced druggists leaves no doubt as to what black sulphur was in former days, but the black sulphur of to-day is evidently a modern production.

From the analytical results and other information gathered here and there, I would suggest the following formula:

Sulphur	9 parts.
Lampblack or powdered charcoal	1 part.

If it is necessary to employ antimony sulphide, the following formula gives a fairly good product:

Sulphur	88 parts.
Antimony sulphide	12 "

I wish here to kindly thank Messrs. Ebert and Heinitsh for their useful information and prompt responses.

THE OILS OF WINTERGREEN AND BIRCH.

By Henry Trimble.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 148.

In the year 1889[1] Mr. Hermann J. M. Schroeter and the writer made a chemical study of the oils of wintergreen and birch. Our results were criticised soon after by Dr. F. B. Power,[2] who offered, in the same article, the results of a similar study conducted by him, which results differed in almost every particular from those obtained by us.

Dr. Power, associated with Dr. Clemens Kleber, has recently[3] published the conclusions reached after a further investigation conducted by them.

In this second study the authors have obtained results which in many respects agree with those obtained six years ago by Mr. Schroeter and myself; yet the casual reader would probably think, on examining their conclusions, that nearly all of them were new. Since writers of text-books often do not quote recent investigations, especially where there have been some differences of opinion, simply because they do not see comparative statements, I have thought that a concise account of the facts as they now exist might aid some writers to quote more recent views than those of Cahours in 1843. In making the following comparison, I wish it distinctly understood

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[1] *Am. Jour. Pharm.*, 61, 398.

[2] *Pharmaceutische Rundschau*, 7, 283.

[3] *Pharmaceutische Rundschau*, 13, 228.

that I am not endeavoring to cast a reflection on any of Dr. Power's results, but that I simply desire to have the facts of the case known.

SUMMARY OF THE MOST IMPORTANT CONCLUSIONS REGARDING THE COMPOSITION OF THE OILS OF WINTERGREEN AND BIRCH.

Trimble and Schroeter, in 1889.	*Power*, in 1889.	*Power and Kleber*, in 1895.
"We find, in addition to methyl salicylate, in both oils a hydrocarbon of the formula $C_{15}H_{24}$ * * The amount of the hydrocarbon is from 0·3 to 0·447 per cent., and it becomes solid on standing a short time, or on cooling. It is probably made up of a solid and a liquid portion."	"The natural oil of wintergreen consists of methyl salicylate, with small amounts (0·3 per cent. or less) of a terpene. The latter is a slightly yellowish, somewhat viscid liquid, having an odor, as described by Cahours, resembling that of black pepper, a specific gravity of approximately 0·940, and does not solidify or separate any solid substance at a temperature of — 10° C."	"Oil of wintergreen (Gaultheria) contains about 99 per cent. of methyl salicylate, together with a small amount of a paraffin, which is probably triacontan, $C_{30}H_{62}$, an aldehyde or ketone, an apparently secondary alcohol, $C_8H_{16}O$, and an ester $C_{14}H_{24}O_2$."
"The oils are physically and chemically identical, the only difference detected being in the melting points of the hydrocarbons. That from wintergreen melted at from 10° to 15° C., and that from birch at 18° C."	"The oil of birch, when pure, consists simply of methyl salicylate."	"Oil of sweet birch (Betula), in its unrectified state, contains about 99·8 per cent. of methyl salicylate, together with a very small amount of the above-mentioned paraffin, $C_{30}H_{62}$, an aldehyde or ketone, and the ester $C_{14}H_{24}O_2$, but does not contain the alcohol $C_8H_{16}O$, which is found in gaultheria oil."
"We find in both oils small quantities of benzoic acid and ethyl alcohol."	"In the natural oils of wintergreen and birch examined by me, no trace of benzoic acid could be detected, nor has sufficient evidence as yet been afforded to establish beyond doubt the presence of ethyl alcohol in these oils."	"Neither the oil of gaultheria nor the oil of sweet birch contains any trace of benzoic acid or its esters, nor do they contain any terpene or sesquiterpene."

There are other results summarized in all three contributions, but they are not especially matters of dispute. In the absence of any observations of my own on the optical properties of these oils, I am willing, for the present, to accept those of Power and Kleber, who state that oil of sweet birch is optically inactive, and that oil of

wintergreen deviates the ray of polarized light — 0° 25′, in an 100 millimetre tube.

The results, as parallelled in the foregoing chart, show that Power and Kleber's conclusions in 1895 are much nearer Trimble and Schroeter's of 1889 than they are to those of Power in that same year.

The additional compounds separated from the hydrocarbons of these oils by Power and Kleber in no way reflect on the work of Mr. Schroeter and myself, since we first pointed out the fact that these hydrocarbons separated into a solid and liquid portion, and, in the face of figures obtained by us for a sesquiterpene, we made a reservation and predicted that a further investigation, which we could not make at that time, would show these hydrocarbons to be made up "of two or even more compounds." So far as the results of Power and Kleber, concerning these hydrocarbons, are new, I accept them until such a time as I can further study these oils.

The only vital question at issue now is concerning the presence or absence of benzoic acid and ethyl alcohol in these oils. Power and Kleber have apparently not tried the method employed by Trimble and Schroeter for the separation and detection of benzoic acid; they simply declare it absent because the acid which they separated from the oils "melted at precisely 155·5° C.," and, I may add, at least one-half of a degree below the generally accepted melting point of pure salicylic acid.

The secret process of rectifying these oils, referred to by Power and Kleber, is not one of distillation, as presumed by them, but simply filtration through absorbent cotton; at least, that is the practice at a number of distilleries visited by me.

AN EXAMINATION OF LIME WATER AND COMPRESSED LIME TABLETS.

By David L. Greenawalt, Ph.G.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 149.

To ascertain the quality of lime water as ordinarily dispensed, samples were obtained from retail drug stores located in Philadelphia and some neighboring cities and towns. These samples were examined in such manner as would decide whether they conformed to the following requirements, which the United States Pharmacopœia gives for lime water:

"It gives a strongly alkaline reaction with litmus paper."

"The alkaline reaction of the solution should entirely disappear after it has been saturated with carbon dioxide, and subsequently boiled (absence of alkalies and their carbonates)."

"Fifty c.c. of solution of lime should require, for complete neutralization, about 20 c.c. of decinormal oxalic acid V. S. (corresponding to about 0·14 [0·148] per cent. of calcium hydrate), phenolphtalein being used as indicator."

Twenty-one samples were examined.

All of the samples were found to be alkaline in reaction.

Number 1 contained alkalies.

Numbers 3, 5, 12 and 19 were cloudy when purchased.

Numbers 7, 16, 18 and 20 did not clear with excess of carbon dioxide.

Number 11 contained chlorides and sulphates, for which all of the samples were tested. Phosphates and barium were absent from all the samples.

The following table gives the number of cubic centimetres of decinormal oxalic acid volumetric solution required to neutralize 50 cubic centimetres of the sample (20 c.c. being required by the U. S. P.):

Sample.	No. c.c.	Sample.	No. c.c.	Sample.	No. c.c.
1	19·8	8	20·0	15	20·0
2	21·6	9	18·5	16	21·5
3	18·5	10	21·9	17	21·6
4	18·6	11	19·2	18	22·5
5	8·6	12	8·7	19	20·7
6	26·1	13	21·5	20	21·3
7	18·5	14	20·7	21	20·3

Two or three years ago, there were placed on the market compressed tablets and tablet triturates of lime for making official lime water by simple trituration with water.

Samples of these were procured, and, besides determining the strength of the lime water which they yielded, were examined in a general way.

The tablets and triturates were treated with water according to the directions accompanying them for preparing lime water.

None of the several samples were entirely soluble in water although number 4 was almost completely dissolved.

Fifty c.c. of the mixture, which was obtained when the tablets or triturates were rubbed with the quantity of water directed, were titrated with the oxalic acid solution. After this, some of the mixture was filtered and 50 c.c. of the clear filtrate were likewise titrated.

The following results of the titrations are stated in the number of cubic centimetres of decinormal oxalic acid volumetric solution required for the 50 c.c. titrated (20 c.c. being required by the U. S. P.):

Sample.	Form.	No. c.c. for 50 c.c. Product.	
		Cloudy.	Filtered.
1	tablet	1·2	—
2	"	16·3	8·8
3	tablet triturate	10·2	8·7
4	tablet	13·8	10·1
5	"	2·7	2·1

All of the samples contained carbonates. All were free from sulphates, chlorides, phosphates and alkalies.

Number 4 was completely dissolved by diluted hydrochloric acid; the other samples were not entirely soluble in this liquid.

Number 2 contained magnesium. Glucose was not present in any of the samples. Cane sugar was found in numbers 2, 3, 4 and 5. Starch was detected in number 5, which tablet yielded a product that had but a slightly alkaline reaction towards litmus. Traces of iron were found in numbers 2, 3 and 4.

The cane sugar had probably been introduced as a diluent in the making of the tablets. Additional quantities of this substance were added, in order to ascertain whether it would increase the strength of the lime water by dissolving any calcium hydrate that might have failed to dissolve in the water supplied; but as no such effect was observed, it would appear that the remaining calcium had assumed the form of carbonate.

The results of these examinations show that but little of the lime water dispensed is of the strength required, and that official lime water was not obtainable from any of the tablets or tablet triturates examined.

ERIODICTYON GLUTINOSUM.

By F. W. Ritter, Ph.G.

Contribution from the Microscopical Laboratory of the Philadelphia College of Pharmacy.

Eriodictyon, or Yerba Santa, as it is more commonly known, is an indigenous shrub, which grows abundantly upon dry hills in the western and southern portions of California. It is a member of the water-leaf family, or natural order Hydrophyllaceæ. The genus Eriodictyon to which it belongs, is a very small one, both as to the number of species and the area of distribution. There are only four species known. The generic name Eriodictyon is derived from two Greek words, namely, *erion*, wool, and *diktyon*, a net; hence, so called from the finely netted or reticulated veinlets which are conspicuous on a fine woolly ground upon the lower surface. The specific name glutinosum has reference to the viscid character of its upper surface. Eriodictyon glutinosum grows to the height of from three to five feet. The leaves are alternate, and from three to six inches in length. Their general outline is oblong lanceolate, the base tapering into more or less of a petiole. The apex is acute, and the margin is irregularly serrate and beset with rigid teeth. Sometimes the margin is entire. The upper surface is green, smooth and glutinous, which is due to a resinous exudation; the lower surface is whitened between the reticulations by closely matted hairs. The texture is leathery and rigid, the venation pinnate and finely reticulate. The principal veins, which extend from the midrib toward the margin, are mostly alternate from each side of the midrib and near the margin anastomose, forming a rather distinct, wavy, sub-marginal vein. From this, short veins are continued to the margin, terminating at the apex of the rigid teeth. The margin of the dried leaf is slightly revolute, especially near the base.

Eriodictyon glutinosum was formerly known as Eriodictyon Californicum, and this latter name is still preferred by some botanists. The corolla is tubular funnel-form, half an inch long, thrice the length of the sparsely and slightly hairy calyx.

The plant is popularly known under various synonyms, among which may be mentioned consumptive's weed, mountain balm, saint herb, bear's weed and mountain peach. The leaves were made official in the U. S. P. of 1890. The fluid extract, which is the only official preparation, is made by percolating the leaves, reduced to a No. 60

powder, with a menstruum consisting of 4 parts of alcohol and 1 part of water. This preparation is given in doses of ½ to 1 fluid

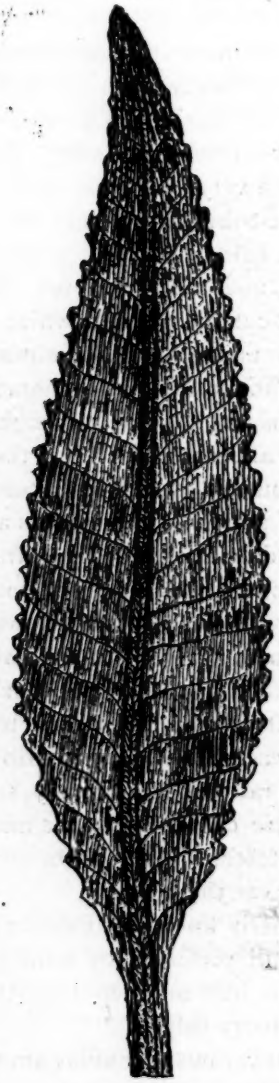

FIG. 1.

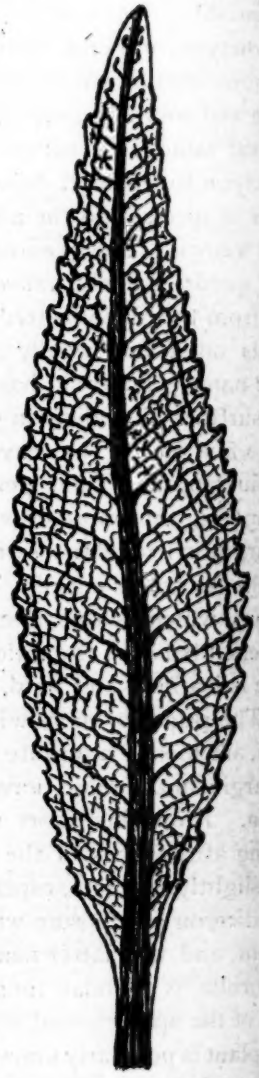

FIG. 2.

drachm (1·8 to 3·7 c.c.). An aromatic syrup and an aromatic elixir, both made from the fluid extract, have been used for some time to disguise the taste of quinine and other bitter substances. The former

is known as *syrupus corrigens.* Yerba Santa is often smoked like tobacco, the smoke being inhaled and giving relief in asthma. The fluid extract is also said to afford relief in the same complaint. The natives of the Pacific Coast have long esteemed it as endowed with rare value in all diseases of the respiratory organs. It has also been

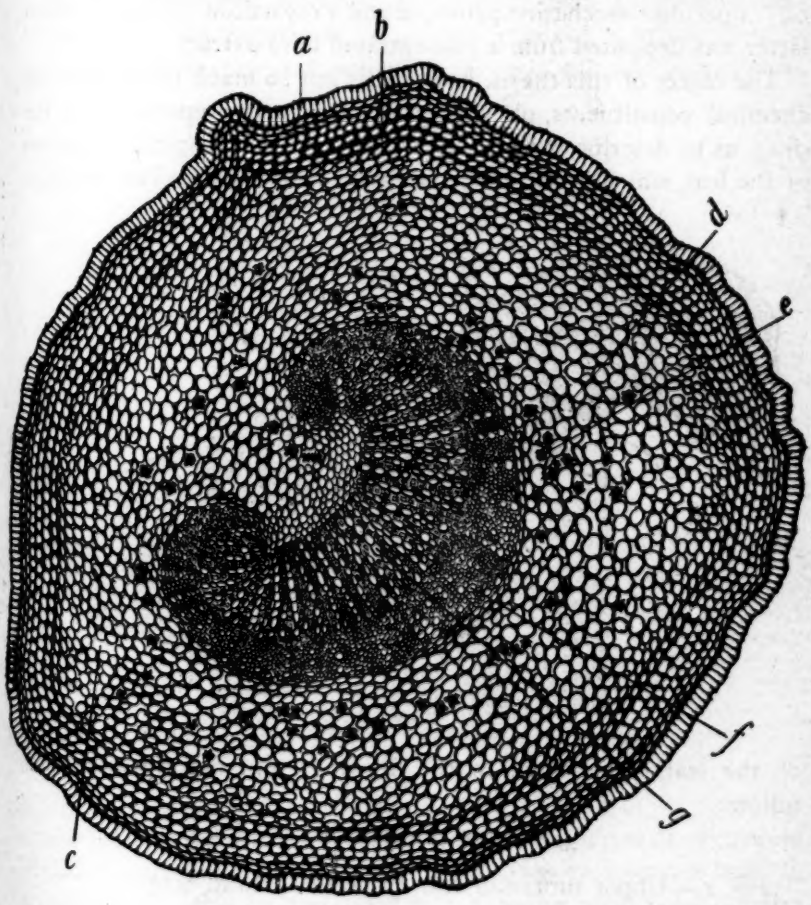

FIG. 3.

used in the form of a tea, and a solid extract has been prepared. One of the most remarkable properties of the drug is its power of completely destroying the bitter taste of quinine, and it is very often prescribed with reference to this property. The leaves have an aromatic odor, and a balsamic and sweetish taste.

The medicinal virtues of the drug are supposed to be due to its resinous matters, in which it is exceedingly rich. One investigator separated the following constituents from the drug: Two resins, one soluble in alcohol and one in ether; a bitter principle, soluble in water, and partly so in alcohol; gum; tannin; a fixed and a volatile oil; a peculiar saccharine principle and a crystalline principle, which latter was deposited from a concentrated fluid extract.

The object of this thesis, however, is not so much to describe the chemical constituents, physiological action, and preparations of the drug, as to describe the macroscopical and microscopical characters of the leaf, which is the medicinal part of the plant. The structure

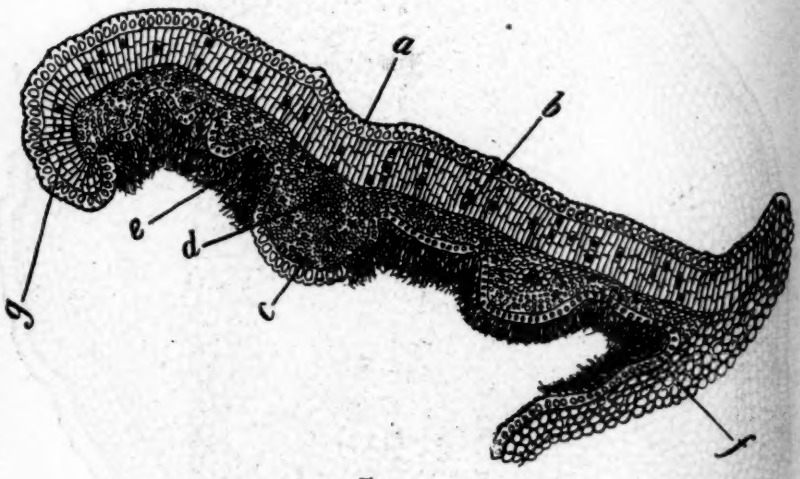

FIG. 4.

of the leaf is indicated in the drawings and descriptions which follow:

LIST OF DRAWINGS.

Fig. 1.—Upper surface of leaf, twice the natural size.

Fig. 2.—Lower surface of leaf, twice the natural size.

Fig. 3.—Transverse section of the petiole, magnified 30 diameters. *a*, the epidermis of the petiole, composed of a single layer of cells which are thickened and slightly cutinized upon their exterior surface, and presenting a fringed appearance; *b*, several layers of collenchyma or thick angled cells underlying the epidermis; *c*, intercellular spaces in the parenchyma; *d*, parenchyma tissue sur-

rounding the vasal bundle; *e*, crystals of calcium oxalate in the parenchyma cells closely encircling the vasal bundle; *f*, phloem portion of the vasal bundle facing the lower surface of the leaf; *g*, xylem portion of vasal bundle showing the radial arrangements of ducts.

Fig. 4.—Transverse section of a portion of lamina adjoining midrib, magnification, 50 diameters; *a*, epidermal cells arranged in a single layer, cells very thick-walled; *b*, layers of palisade parenchyma

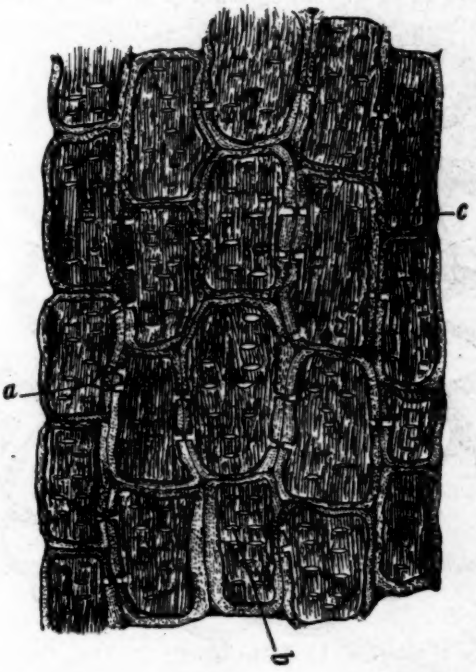

FIG. 5.

composed of several rows of cells and containing crystals of calcium oxalate; *c*, spongy parenchyma adjoining lower epidermis of leaf; *d*, transverse section through lateral vein, showing small vasal bundle; *e*, long, matted hairs upon lower surface; *f*, portion of adjoining midrib; *g*, slightly revolute margin.

Fig. 5.—Longitudinal section of parenchyma cells of midrib, magnification, 250 diameters; *a*, pit in parenchyma cells as seen in section; *b*, pits in parenchyma cells face view, longitudinal section of cells; *c*, middle lamella.

Fig. 6.—Small portion of under epidermis magnified 250 diameters; *a*, base of long woolly hair; *c*, cell contents shrunken from walls, due to treatment with alcohol; *d*, middle lamella.

Fig. 7.—Longitudinal section through the midrib; *a*, ducts of the vasal bundle, showing spirals; *b*, adjoining phloem tissue in longitudinal section; *c*, ends of ducts as seen when focus is slightly changed.

Fig. 8.—Various forms of hairs from the leaf, magnified 250 diameters; *a*, short multicellular glandular hair found upon upper

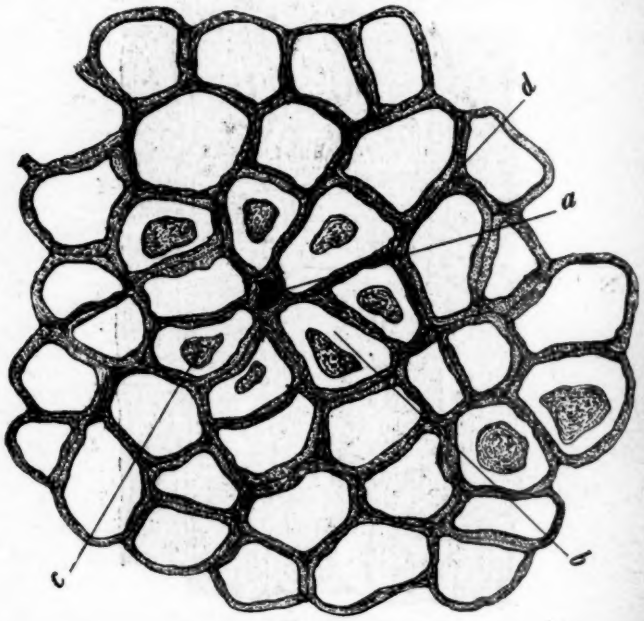

FIG. 6.

surface of blade and also upon midrib; *b*, an unusual form of hair observed upon the petiole; *c*, one of the long woolly hairs which abound upon the lower surface of leaf, and which give to it its characteristic whitish appearance.

The microscopic mounts from which the drawings were made were prepared in the following manner: The sections were made by means of the "Student's Microtome," bleached with Labarraque's solution, washed, stained with iodine green, dehydrated with alcohol and absolute alcohol, then saturated with eosin in oil of cloves and mounted in balsam.

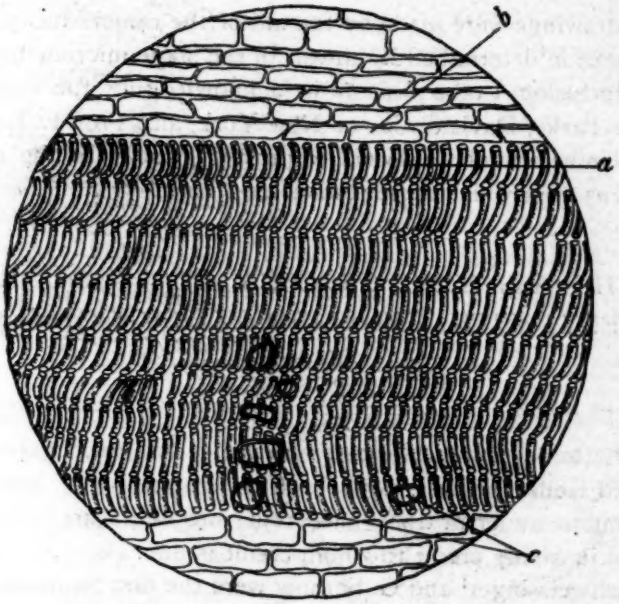

FIG. 7.

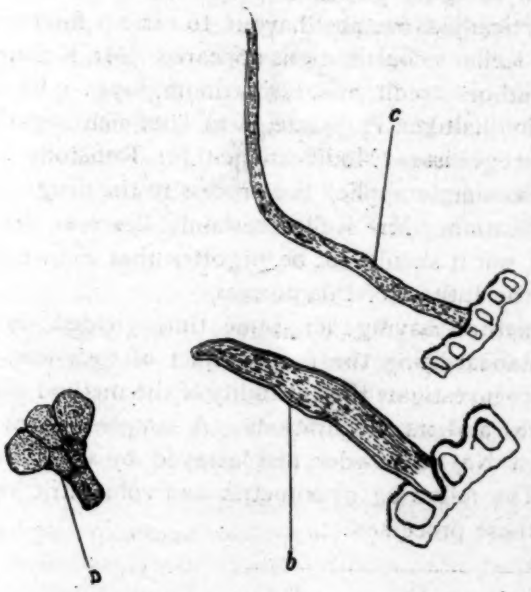

FIG. 8.

The drawings were made by the aid of the camera lucida and the magnification determined by means of the stage micrometer.

In conclusion, I take pleasure in acknowledging the kindness of Messrs. Parke, Davis & Co., of New York, and Prof. E. L. Greene, of the University of California, in providing me with the excellent specimens from which these studies have been made.

ON THE ASSAYING OF COCA LEAF, AND EXPERIMENTS WITH THE FLUID EXTRACT OF COCA.

By Lyman F. Kebler.

Presented, in part, at the American Pharmaceutical Association, Denver, 1895.

Since this communication is, primarily, an investigation of the so-called Keller process, it will not be inappropriate here to call attention to an error that has crept into literature. The writer believes in giving credit to whom credit is due.

O. Schweissinger[1] and G. Sarnow were the first to apply and call attention to the advantages possessed by a mixture of chloroform and ether in assaying galenical preparations. They applied the method, practically as we now have it, to various fluid extracts, two years before Keller's contributions appeared. Mr. Keller[2] duly gives the above authors credit, and, furthermore, says: "Es eignet sich für alle alkaloidhaltigen Präparate, ja es lässt sich sogar (selbstverständlich mit gewissen Modificationen) für Rohstoffe anwenden." Mr. Keller has simply applied the process to the drug itself, with a slight modification. Mr. Keller certainly deserves credit for his modification, but it should not be forgotten that Schweissinger and Sarnow are the authors of this process.

Keller's method having for some time yielded unsatisfactory results in standardizing the fluid extract of coca leaf, the writer determined to investigate the reliability of the method when applied to coca leaves and its preparations. A sample of coca leaves was reduced to a No. 40 powder, and assayed by all the well-known methods. The following gravimetric and volumetric results were secured by these processes:

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[1] 1890, Pharm. Centralhalle, 31, 771.

[2] 1892, Schweiz. Wochenschr. f. Chem. u. Pharm., 30, 501.

Methods.	Per cent. of Alkaloids, Gravimetrically.	Per cent. of Alkaloids, Volumetrically.
Squibb[1]	0·75	0·67
v. d Marck[2]	0·64	0·485
Pfeiffer[3]	—	0·58
Lyons[4] (general)	0·503	0·481
Lyons[4] (ether)	0·523	0·516
Lyons[4] (benzine)	0·51	0·34
Lyons[5] { ether, 25 parts / benzine, 70 parts }	0·72	0·521
Keller[6] (4 hours maceration)	0·56	0·532
Keller (24 hours maceration)	0·62	0·563

In order that a method may be of the greatest practical value, it must be easily executed, extract the largest percentage of alkaloids possible in a comparatively short time, and at the same time be neat. Dr. Squibb's method extracts the largest per cent. of alkaloids, but requires too much time. Marck's method requires too much time, and yields unsatisfactory results, volumetrically. Pfeiffer's process is adapted for volumetric work only. While this method gives fairly satisfactory results, it is inelegant, and great care must be exercised to remove all of the caustic soda. Lyons' general method of assay, and the one in which ether is the principal solvent, are quite satisfactory. The benzine method is inaccurate. The method, as modified by Messrs. Caspari and Dohme, yields good results. The Schweissinger-Sarnow method, as modified by Keller, yields the most satisfactory results. Several other methods were tried, but were never finished, on account of the stubborn emulsions formed.

In concluding this part of the work, it is only necessary to say that Keller's method has proven itself superior to Lyons' method in extracting a slightly larger per cent. of alkaloids, and is less prone to emulsify.

Mr. Dohme presented a paper, at the last meeting of the Ameri-

[1] 1885, Ephemeris, 2, 784.
[2] 1889, Nederl. Tydschr. v. Pharm. Chem., April; Analyst, 14, 115.
[3] 1887, Chem. Ztg., 11, 783 and 818.
[4] Pharmaceutical Assay, § 29–36, 154–157.
[5] 1893, Am. J. Pharm., 65, 478.
[6] 1892, Schweiz. Wochenschr. f. Chem. u. Pharm., 30, 501; Am. J. Pharm., 65, 78.

can Pharmaceutical Association on the same subject. While we, ultimately, arrive at the same conclusion, the writer cannot agree with Mr. Dohme that Keller's process is so vastly superior to all other processes of assay.

The next step was to percolate a portion of the leaf according to the official process for preparing a fluid extract. This fluid extract yielded 0·43 per cent. (grav.) of alkaloids by Keller's process. The marc was then dried and assayed by the same process, and yielded 0·16 per cent., or a total of 0·59 per cent., against 0·62 per cent., the total amount of alkaloid contained in the crude drug by the same process (grav.).

These results prove (1), that the above process extracts the alkaloids as completely from the fluid extract as from the drug itself; and (2), that diluted alcohol does not extract the drug completely, even when well percolated.

Experiments were next undertaken to determine the conditions most favorable for extracting the active principle of coca leaf in preparing the fluid extract. In each experiment 100 grammes were percolated with 120 cubic centimetres of the menstruum.

The following table embodies the condition under which the experiments were performed and the results obtained:

Fineness of Powder.	Menstruum.	Per cent. of Alkaloids in Fluid Extract. Grav.
No. 12	65 per cent. alcohol	0·19
No. 40	65 per cent. alcohol	0·29
No. 40	Diluted alcohol[1]	0·21
No. 40	Diluted alcohol	0·20
No. 12	Diluted alcohol	0·18

[1] Acidulated with one-tenth of a per cent. of tartaric acid.

The drug assayed by Keller's process: No. 12 powder, 4 hours 0·20 per cent.; 24 hours, 0·32 per cent. No. 40 powder, 4 hours, 0·21 per cent., and 24 hours, 0·32 per cent.

These results show that a 65 per cent. alcoholic menstruum extracts the alkaloids better than diluted alcohol, and a moderately fine powder is better than a very coarse one. These facts have been demonstrated on a large scale since the experiments were made. The acidulation does not facilitate extraction. It is unfortunate that a low assaying leaf was operated on, but the facts remain the same.

A CONTRIBUTION TO THE CHEMISTRY OF AUSTRALIAN MYRTACEOUS KINOS.[1]

By J. H. Maiden, F.L.S., and Henry G. Smith.

Read before the Royal Society of N. S. Wales, June 5, 1895.

In the investigations that have been carried out at the Technological Museum during the last few years, on the exudations of the Australian Myrtaceæ, it has been found that these substances, known as kinos, fall into three classes, which have been respectively named the ruby, gummy and turbid groups. The members of the first of these are soluble both in alcohol and water, giving a ruby-colored solution; those of the second are practically insoluble in alcohol; and the third, when treated with hot water, and allowed to cool, contain a body or bodies which render the liquid turbid.

We now deal with kinos belonging to this last group, the present investigation having been carried out with the view to identify the substances causing the turbidity already referred to.

In the papers already published[2] it was suggested that this body was catechin for the following reasons: it was mostly dissolved in boiling water, but separated again on cooling; it gave an intense purple color with concentrated sulphuric acid (in the case of the precipitate of the Eucalyptus kino tested); it gave a yellow color with caustic potash. For these reasons, which are admittedly inconclusive, the substance was at the time considered to be catechin. Work on these kinos has been since proceeded with.

At the recent meeting (January, 1895) of the Australasian Association for the Advancement of Science, held at Brisbane, Dr. Lauterer, of that city, read a paper on "Queensland Native Astringent Medicines." In this paper, which has since been published,[3] the writer seeks to show that the substance causing turbidity in kinos is ellagic acid. As the presence of ellagic acid has not been detected by us in kinos, we considered that the time had arrived when the results of our experiments in this connection might be usefully published. We announce before this society the separation of two new organic substances—eudesmin and aromadendrin, the latter name being used provisionally—to the presence of which, either singly or in company, the turbidity of some kinos is due.

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[1] Abstracted by J. C. Peacock.

[2] Proc. Linnean Society, N. S. W., 2, VI., 389 (1891).

[3] *Chemist and Druggist* of Australasia, 1895, p. 108.

We have restricted our researches to a typical Eucalyptus kino belonging to the turbid group, namely, that of Eucalyptus hemiphloia, F. v. M., and also that of Angophora lanceolata, Cav., as the exudations of this genus closely resemble some of the members of the turbid group of Eucalyptus kinos.

Eudesmin can be easily obtained crystallized and in a pure state by the method about to be described.

When the kino of Eucalyptus hemiphloia is finely powdered and treated with ether in a dry state, practically nothing is taken into solution; but if a small quantity of water is added to the fine powder and gently heated, a thick paste is formed. If, on cooling, this paste be transferred to a separator, ether added and well agitated, it partly goes into solution, the ether presenting a yellow color. By repeated agitation, removal of the ethereal layer, addition of fresh ether, and repetition of the process for about two days, the greater portion of the substances soluble in ether are removed, no emulsion being formed. The ether used in these successive extractions is mixed, distilled off at a low temperature, and the residual mass, partly resinous-looking and partly crystalline, is digested in absolute alcohol (in which it is readily soluble with the aid of heat), transferred to a beaker and allowed to cool. If only a very small quantity of the alcohol has been added, nearly the whole of the eudesmin will crystallize out. These crystals can be transferred to a filter, washed with rather dilute alcohol to remove the amorphous resinous-looking body, and transferred to a porous substance to drain. After recrystallization, the appearance of the body is that of a pure white mass, with a lustre resembling spermaceti. It is necessary that the successive filtrates obtained from these crystals be placed in a vessel to allow of the slow evaporation of the alcohol, so that the remaining crystals of eudesmin may form and so be removed, or the filtrates may be evaporated to dryness, and again treated with absolute alcohol with the aid of a gentle heat, and the previous process repeated. If care is taken in the manipulation, it is possible to almost entirely remove eudesmin from these solutions, and so separate it from the resinous-looking body, which is readily soluble in even dilute alcohol.

The crystals of eudesmin, which are obtained by slowly evaporating an alcoholic solution, are rhombic prisms; larger crystals are obtained by slow crystallization from amyl alcohol; these crystals

extinguish parallel to the principal axis and polarize at times in bright colors. They show faces of the right rhombic prism with brachypinakoids. The termination planes are mostly macrodomes, pyramidal faces not having yet been detected. The formula, therefore, is:

$$(\infty P + \infty \breve{P} \infty + \bar{P} \infty).$$

The eudesmin crystallized from absolute alcohol was found to be anhydrous. When it is dissolved in hot alcohol, water added until the slightest precipitate appears to form, and the solution left to stand for some hours, beautiful acicular crystals are obtained, in some cases, of nearly half an inch in length.

Eudesmin is soluble in hot water, but crystallizes out again on cooling. It melts on the surface of mercury at 99° C. into a whitish resinous-looking mass, partly transparent; and on this account, care must be taken not to raise the temperature too rapidly or too high when determining its solubility in water, as it fuses into a globular mass. It is also soluble in ether, acetic ether and chloroform, but not in benzol, petroleum spirit or bisulphide of carbon. Its solutions in water and alcohol are neutral in reaction.

Aqueous or alcoholic potash solutions exert but slight solvent action on eudesmin, either in the cold or on warming. Glacial acetic acid dissolves it, and the addition of water causes it to separate.

Eudesmin is odorless and almost tasteless, being very slightly sweetish. When ignited it readily burns with a very smoky flame. Concentrated sulphuric acid dissolves eudesmin with the production of a dark color, which changes to purple; after standing some time or when water is added, this color fades and a dark precipitate separates. Eudesmin is soluble in strong nitric acid with a beautiful yellow color; after a time dendritic forms of a light yellow color make their appearance, and continue to increase until the alteration is completed. These reactions with sulphuric and nitric acids appear to be characteristic.

Fuming nitric acid behaves like strong nitric acid, except that it dissolves the eudesmin with explosive violence. It is to these alteration and decomposition products that we must eventually look to determine the molecular constitution of eudesmin.

To ascertain the chemical composition, two combustions were

made. The percentage results obtained were practically the same in both cases:

	Mean of Two Combustions.	Calculated for $C_{26}H_{30}O_8$
Carbon	66·2050	66·383
Hydrogen	6·5225	6·383
Oxygen	27·2725	27·234
	100·0000	100·000

From the results of these combustions we may consider $C_{26}H_{30}O_8$ as the empirical formula of eudesmin.

The kino of Angophora lanceolata does not appear to contain eudesmin.

As eudesmin is soluble in hot water and but slightly in cold water, this property, of course, indicates that it assists to give turbidity to aqueous solutions of kinos; but the large proportion of a resinous-looking body extracted by ether, and left on removal of eudesmin, points to the fact that eudesmin is not the only substance that causes this turbidity.

As before mentioned, it has been stated emphatically that the substance causing this turbidity is ellagic acid. We will submit that ellagic acid is not present in either the kino of Eucalyptus hemiphloia or in that of Angophora lanceolata. The ready solubility in boiling water of the precipitated substances on cooling from a hot aqueous solution of the kino, by itself tends to indicate that the substance cannot be ellagic acid, as this acid is practically insoluble in water even on boiling. Its ready solubility in alcohol also tends to indicate that it is not ellagic acid. As the precipitated powder causing the turbidity when the kino of Angophora lanceolata is treated with water has been particularly mentioned as consisting of almost pure ellagic acid, and as the kino of Angophora lanceolata does not appear to contain eudesmin, a portion of the above precipitated powder (from cold water) was decomposed by fusing with potash. The products of decomposition were found to be protocatechuic and acetic acids, which points to the fact that the powder was not ellagic acid.

The protocatechuic acid is readily obtained in a crystalline state by removing the volatile acids from the solution acidified with sulphuric acid, with petroleum spirit, and then agitating with ether.

We subjoin a tabular statement of the reactions obtained with ellagic acid, freshly prepared from divi-divi (pods of Cæsalpinia

coriaria), and with the precipitate from the kino of Angophora lanceolata, prepared exactly in the same way, namely, by concentrating a solution of the material in alcohol, pouring into water, filtering, washing, dissolving in alcohol, again filtering, and evaporating to dryness.

ELLAGIC ACID FROM DIVI-DIVI.	REPUTED ELLAGIC ACID FROM ANGOPHORA LANCEOLATA.
Strong HNO_3 dissolves with reddish to crimson color; on adding H_2O, light yellow is produced.	Strong HNO_3 slightly dissolves, forming a light yellowish color.
Fuming HNO_3 dissolves, forming a red color, not so crimson as preceding.	Fuming HNO_3 dissolves, forming a dark, reddish-brown color; on adding H_2O, a yellowish, resinous-looking body separates.
KOH dissolves dark yellow.	The same.
H_2SO_4 dissolves instantly to a beautiful purple, becoming purplish black on standing.	H_2SO_4 dissolves instantly, forming a yellow color, which becomes dark brown on standing.
Boiled with H_2O, very little dissolves; the solution, when treated with Fe_2Cl_6, gives a purple color, changing to blackish (ink).	Boiled with water dissolves entirely, precipitates again on cooling; when heated with Fe_2Cl_6, dirty green color and dirty green precipitate are formed.
The dried powder, placed in Fe_2Cl_6 solution, soon becomes bluish black; on standing, becomes more black.	The dried powder, placed in Fe_2Cl_6 solution, becomes greenish brown, becoming greener on standing.
When a solution in alcohol is evaporated, a crystalline deposit is formed, easily seen under the microscope.	Solution in alcohol dries mostly as an amorphous varnish or dull powder, not crystalline, as seen under the microscope.

As ellagic acid has as yet only been detected in substances which give pyrogallol on decomposition, the substances (tannates) obtained by precipitating the aqueous solution of Eucalyptus hemiphloia kino (from which the bodies soluble in ether had been removed) with neutral acetate of lead, and also that obtained by adding basic acetate of lead to the filtrate from the first precipitate, were taken. The lead from these precipitates was removed by sulphuretted hydrogen and the filtrates evaporated to dryness.

By heating these two tannins in glycerin for half an hour, at 200° C., the decomposition product was in both cases catechol, and not

pyrogallol, and a yellowish, resinous-looking body, difficultly soluble in cold water, but soluble in boiling water, was also removed by the ether at the same time.

This reaction shows that the tannic acid was not one likely to give ellagic acid as a decomposition product.

When portions of these same tannins were heated in a closed tube for one hour, at 100° C., with dilute hydrochloric acid, a body in appearance allied to one of the red decomposition products known as kino red, elm red, hemlock red, etc., is obtained as a product of decomposition. From these results, although we might be inclined to look for two tannic acids, we must conclude that there is but one tannic acid in the kino of Eucalyptus hemiphloia.

As the whole of the tannin of Angophora lanceolata kino is precipitated by neutral acetate of lead, we may infer the same also of this kino, the decomposition products of the tannin obtained from the lead precipitate being catechol when decomposed by heating at 200° C. for half an hour, and protocatechuic acid and acetic acid when decomposed by fusing with potash.

From the decomposition products of the tannins from Eucalyptus hemiphloia kino, and from Angophora lanceolata kino, we consider them identical.

As already stated, there is a resinous-looking substance extracted with eudesmin by ether from the kino of Eucalyptus hemiphloia. As this is soluble in boiling water (with difficulty, as it melts into greasy-looking masses), but separates again on cooling, we must consider that this substance also plays a part in the turbidity of this kino as well as eudesmin. This body, when allowed to precipitate from boiling water, is removed from the aqueous solution by agitating with ether, the liquid becoming quite clear, demonstrating that the whole of the bodies causing this turbidity have been removed. As the ether slowly evaporates, crystals form at the junction of the ether and water; these fall through the liquid to the bottom of the vessel, either by themselves or when the vessel is gently agitated. We have only just succeeded in crystallizing this substance, to which we have given provisionally the name aromadendrin, and a subsequent communication will be made to the Society when its chemistry has been worked out.

As seen under the microscope the crystals are plates. In the early state of crystallization the rhombus is the principal form, but,

as they become larger, they form six-sided plates. These polarize most beautifully in bright colors. Aromadendrin crystallizes from boiling water in plates. Ether dissolves it, although not readily; the ethereal solution dries into an almost amorphous substance. Alcohol dissolves it easily.

One determination was made of the melting point; it was found that the crystals melted on the surface of mercury at 162° C.

Its color reactions are as follows, and from the results at present obtained it appears that the characteristic color reaction previously given to ellagic acid, of forming a crimson color with fuming nitric acid, will have to be modified, as the body of which we now write gives this crimson reaction most beautifully clear and pure, not only with fuming nitric acid, but with nitric acid even when slightly diluted. Potassium hydrate gives a bright yellow color, which is permanent in the air even until it is dried up. Sulphuric acid dissolves it yellow, becoming brown on standing. Ferric chloride solution has but little color reaction with the crystals of aromadendrin.

The distinctive color reactions given by eudesmin and aromadendrin serve at once to distinguish them in the absence of any determinations of crystalline form.

The chemistry of the substance causing the turbidity in the kino of Angophora lanceolata will form the subject of a later communication. We have succeeded in isolating a few well-developed crystals of the body.

CULTIVATION OF THE COCO-NUT.[1]

Soil and Climate.—A moist, tropical climate, with good and somewhat sandy soil, near the sea, is the best for the growth of the coco-nut palm. If the tide rises so that the sea may flow in daily over the plantation, so much the better, but drains must then be made, so as to allow the water to run off freely.

Sowing.—Ripe, dry nuts only should be used, and the very largest that can be obtained. Nuts for seed should be gathered from trees that are mature, but not too old, and kept dry for five or six weeks before planting. The nursery bed should be made under slight shade, such as that of the coco-nut palm; it should be thoroughly dug to a depth of two feet, and the soil well mixed up with

[1] From the Bulletin of the Botanical Department, Jamaica, 2, 182.

ashes and coarse salt. At the beginning of the season's rains the nuts are put into this seed-bed on their side, at a distance of one foot apart, and so that about two inches appear above the surface. The nursery-bed should be kept damp, but not too wet. It is a good plan to transplant them into other beds at two feet apart when they are from two to six months old.

Transplanting.—When the seedlings are from six months to two years old they may be transplanted to their permanent positions in the plantation, at distances from each other of twenty feet. Pits should be dug for them, as large as three feet every way in poor soil; ashes and salt are useful additions to any soil, and it may be necessary to give also a top-dressing of manure, which should not be dug in. They should be shaded by bananas or plantains for two years.

Tillage and Manuring.—The Jamaica nuts are very small, and do not give much "meat" as compared with those from Central America, India and Ceylon. This may be due partly to unfavorable conditions of soil, climate, etc.; but much might be done to improve the fruit by careful selection of nuts for seed, and a liberal treatment of the trees in the plantation by tillage and manuring. It is calculated that in India there are 480,000 acres under the coco-nut, and the cultivation is attended to carefully. In Bombay, for instance, after the seedlings are planted out, they are watered every day or two for the first year, every two or three days for the second and third years, and every third day for the fourth and fifth years. "During the rains, from its fifth to its tenth year, a ditch is dug round the palm and its roots cut, and little sand-banks are raised round the tree to keep the rain-water from running off. In the ditch round the tree, 22 pounds of powdered dry fish manure is sprinkled and covered with earth, and watered if there is no rain at the time. Besides fish manure the palms get salt-mud covered with the leaves of the croton-oil plant, and after five or six days with a layer of earth; or they get a mixture of cow-dung and wood ashes covered with earth, or night-soil, which, on the whole, is the best manure." (Watt's Dict.)

In the tropics of the old world generally, it is customary, when the plant is one year old, to dig round the roots and apply ashes once a month; when the tree is two years old, to open up every year, at the beginning of the rains, the roots to a distance of four to

six feet from the stem, to apply ashes and dry manure to the roots, and leave the opening until the end of the rainy season; then to fill in again the soil which has been removed, and level the ground. During the time the roots are exposed, the older worn-out rootlets may be cut away and the roots of other plants removed. Cattle should on no account be allowed in the plantation, as it is most hurtful to the tree to have the leaves bitten, and if the unfolded leaf is injured the tree dies.

Yield.—A tree in good condition yields from fifty to one hundred nuts every year, but good climate, soil and cultivation may bring the yield up to as many as 200 nuts.

The following paragraph is a part of a speech delivered by the Marquis of Ripon, K.G., late Secretary of State for the Colonies of Great Britain, at the anniversary dinner of the Linnean Society. It is a good thing to be honest enough to acknowledge ignorance, but how a Secretary of State for the Colonies could have escaped hearing something of gambier is a mystery.

I had a curious proof the other day of the way in which plants of great value may be but little known to those who do not cultivate science, or are not engaged in those industries in which these plants are employed. I received a deputation from Leeds. Though most of you probably think only of Leeds as an important place for the production of cloth, yet there is a great leather trade in Leeds besides, and this deputation of leading men came to me to do what I could to help to increase the production of gambier. They told me they could not get on without it, that it was absolutely essential to their industry, and that it came shipped to them from Singapore. I believe the largest quantity is not grown in Singapore, but comes from the native states beyond. I am bound to say that until I had received this deputation, I had never heard of gambier. I knew nothing about it.

The interest of this paragraph lies not in the ignorance of the official, but in the information it gives of the growing scarcity of gambier. If that deputation of citizens of Leeds should turn to the United States, they would learn that we have a substance here called canaigre, prepared from the roots of Rumex hymenosepalus, that will sooner or later displace gambier which is of uncertain origin, uncertain quality and uncertain effect.

The verification of the existence of the true *Juan Fernandez Sandal Wood* is recorded in the *Kew Bulletin* for 1894, page 110; and the receipt of a specimen (page 372) from Professor F. Philippi, who described it from very imperfect material. Thanks to Mr. Söhrens, Kew now possesses excellent dried specimens of this most interesting plant (*Santalum fernandezianum*) collected by the donor himself. The following is an extract from Mr. Söhren's letter on this subject:

"It may be interesting to you to know that, after many years' search, only one live tree of the sandal wood has been found, which was in flower in the middle of April. The height of the tree to the first branch is 5·4 metres. The nearly horizontal branches prevented my measuring the total height, which may be about 8 metres; circumference, 1·5 metres at 0·5 metres from the ground."

EDITORIAL.

ANIMAL CHARCOAL AS A PILL EXCIPIENT.

Señor Eviclé, in *Revista Farmaceutica Argentina*, has contributed an article on the foregoing subject, which deserves more than passing attention. There is no doubt that animal charcoal is an excellent absorbent; but before it is adopted as a pill excipient it would be just as well to inquire whether its active absorbing property is not an objection. In the article referred to, for a translation of which we are indebted to the *Pharmaceutical Journal* of October 5th, the following formula is offered:

Beech creosote	1 gramme.
Tannin (prepared with ether)	1 "
Iodoform	1 "

Make twenty pills.

To quickly get a satisfactory and smooth mass, first absorb the creosote with animal charcoal as previously directed, add the tannin and iodoform triturated together, mix well and mass with Venice turpentine. Pills thus prepared may be sent out rolled in magnesia, silvered or varnished with tolu varnish, which latter helps to mask the caustic taste of the creosote, although the animal charcoal does this to a great extent.

It strikes us that this is a step in the wrong direction in the administration of medicine, for if the pills made according to this formula should be absorbed in the stomach or intestines it would indicate a greater power of these organs than they usually get credit for. Possibly a more resistant pill mass might be made, but if so, we don't remember to have heard of it.

Animal charcoal may have a claim as a constituent of certain pill masses, but it should be so compounded with the other ingredients as to make a mass that would readily disintegrate in the liquid contents of the stomach.

CREOSOTE OR CREASOTE?

Joseph Ince contributed a paper on this subject to the *Pharmaceutical Journal* of October 12th, in anticipation of the issue of the Imperial Pharmacopœia. His citation of authorities is quite extensive, but he has apparently overlooked an important contribution on the same question by Charles Rice in the AMERICAN JOURNAL OF PHARMACY, April, 1894. Dr. Rice practically exhausted the subject, and presented overwhelming reasons for adopting "creosote." If there is any doubt in the minds of the compilers of the British Pharmacopœia on this matter, they should by all means read Dr. Rice's remarks.

H. C. Myers, Ph.D., has undertaken the directorship of a department of pharmacy, recently established in the University of Washington, at Seattle. Dr Myers attended the session of 1886–87, at the Philadelphia College of Pharmacy, and then went to Europe, where he studied chemistry, first at Göttingen and later at Strassburg, where he took his degree. He has been for some time instructor in chemistry at Stanford University.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

ETIDORHPA, OR THE END OF THE EARTH. The strange history of a mysterious being and the account of a remarkable journey, as communicated in manuscript to Llewellyn Drury, who promised to print the same, but finally evaded the responsibility, which was assumed by John Uri Lloyd, with many illustrations by J. Augustus Knapp. Author's edition, limited. Published by John Uri Lloyd, Cincinnati, O., 1895.

If it be asked what pharmacy has to do with a volume having the foregoing title, the answer may be given that it contains many scientific matters woven into the thread of the story in a way to make it especially attractive to all thinking pharmacists; then, too, Professor Lloyd, whom we may designate as the sponsor, if not the writer, of the volume, is, or has been, associated with pharmacy in all its phases. He has most creditably prepared his part of the work, and produced a book which will be externally, as well as internally, an ornament to any library.

The body of the work is a manuscript which was communicated to one Llewellyn Drury, of Cincinnati, thirty years ago, who for some reason failed to make it public, and the duty has devolved upon Professor Lloyd. The manuscript details the wanderings of a man who was abducted from his home for publishing the secrets of the society to which he belonged, and who was taken on a long journey into the mysterious regions of the earth's centre. We are told that the story has more truth than fiction in it, and the ingenious selection for its principal character bears this out, for many will recognize him as William Morgan, of Freemason fame, who was abducted at Batavia, N. Y., in 1826.

The story, interesting as it is, must take second place in considering the value of the work, for so much science and philosophy have been moulded into it as to make it worthy of a reading for these alone. Since we have nothing more than the most superficial knowledge of what constitutes the interior of our globe, a journey to its interior recesses furnishes room for the widest kind of speculation, and we return from the voyage with the belief that all our knowledge of everything is as superficial and unsubstantial as the mere film of the earth's crust, which has been explored by man.

There has never been any book like this one written. If it be said to resemble some of Jules Verne's works, the distinction may be drawn that "Etidorhpa" is logical; no miracles were performed to extricate the traveller from the numerous perilous positions in which he found himself, but, on the contrary, he was always released by what appeared to be perfectly rational methods. The physical phenomena described are apparently without a flaw, and some new principles, notably the diffusion of liquids of different densities through porous media, are enunciated, and will stand the test of actual experiment, as the writer of this review knows from having tried them. The chemistry of the work is faultless—so different from that to which we are treated by most literary writers, who usually disgust one with their bad nomenclature and impossible chemical reactions.

The subjects treated are such as require the most careful handling, for many of them border on the unknowable, and it is only by the most acute reasoning that the author prevents the story from becoming "top heavy," but he has succeeded by the most plausible methods. Materialists will derive little con-

solation from the book, and spiritualists will find but little more comfort, for both are treated to a mild vein of sarcasm that is all the more searching because of its freedom from bitterness.

The author has ventured to discuss many things which few writers in the past have dared to undertake. We are told that "matter is retarded motion," and this is demonstrated by the most acute process of reasoning. He also dares to denounce the hypothetical ether which scientists have invented to account for the transmission of heat, light, etc., and declares there is no need for it. It is impossible, in a review, to give the details of how these ends are attained, but the book itself must be studiously read, not once, but twice or thrice. The vivid description of the drunkard's den, and the masterly portrayal of the effects of certain narcotics are the products from a writer of extraordinary resources.

In the words of the author, we may say "to many this manuscript will prove a passing romance, to others an enigma, to others still it will be a pleasing study," and we might add that those who get anything out of it will be required to study it. The author is at once a scientist and a philosopher; he has also shown himself to be a master of a peculiarly beautiful literary style which, in some chapters, may be termed word-painting of the highest order; in fact, the book is full of figurative gems like the following: "As all the bubbles in a glass shrink and vanish when the first collapses, so the troupe of fairy-like forms before me disintegrated and were gone." We have no authority for making the statement, but, in our opinion, there is but one name possible in connection with the authorship of this mysterious book, and that is John Uri Lloyd.

A HANDBOOK OF INDUSTRIAL ORGANIC CHEMISTRY. Adapted for the use of manufacturers, chemists and all interested in the utilization of organic materials in the industrial arts. By Samuel P. Sadtler, Ph.D., F.C.S. Second (revised and enlarged) edition. Philadelphia: J. B. Lippincott Company, 1895. Pp. 537.

Something over three years ago the first edition of this work was reviewed in this JOURNAL. Since that time the author has collected considerable new material and amplified that already written. The valuable bibliography has been carefully brought to date, and the statistics, wherever obtainable, have been revised to the present year. It is needless to say that these two features alone greatly add to the value of the volume.

The general treatment of the several industries, as adopted in the first edition, has been continued, viz.: (1) enumeration and description of the raw material; (2) the processes of manufacture; (3) the products, both intermediate and final; (4) the most important analytical tests and methods; (5) bibliography and statistics. When an industry has been written up in the order of these headings, the subject is practically exhausted.

Among the numerous additions, we note one which will be appreciated by pharmacists, namely, the enlargement of the chapter on soaps, so as to include those manufactured for toilet purposes.

Considerable new material has been added to the chapter on oils; the "chrome tanning" process has been included in the processes of manufacturing leather, and the chapters on the textile industries have been considerably amplified. The appendix has been enlarged by a table on the physical and chemical properties of the fixed oils and fats. Some two years ago, the

first edition of this work was translated into German, in the face of the fact that there were already a large number of works on the same subject in that language. We believe the second edition will be still more popular than the first one, and that it will fill a place in the chemical literature of the United States that is not occupied by any other book.

HANDBOOK OF WEST-AMERICAN CONE-BEARERS. By J. G. Lemmon, Temescal, near Oakland, Cal. Third edition. Published and for sale by the author, at $1 per volume.

The author of this work is carrying on a labor of love for the subject in which he is engaged.

His book is all the more interesting on that account.

Situated in a locality which is particularly rich in cone-bearing trees, he has, by actual observation, been able to classify the sixty members of the order, and suggest reasonable and appropriate common names for the trees which are now loaded with a confusion of terms, or else are neglected altogether.

The preface opens with the statement of a theory for the occurrence of so many species of cone-bearing trees on the Pacific Coast; an appeal is then made for good English names. The author does not propose these to supplant the Latin names; he believes the public are not yet ready for the latter, and that the selection and application of suitable, descriptive and distinguishing names will gradually aid in popularizing the scientific names.

The body of the book is made up of a classification, brief description, and in part illustration of the cone-bearers.

The descriptions are concise and well chosen; the following, concerning the great sugar pine, *Pinus Lambertiana*, will serve to illustrate this:

"The great sugar pine is the accepted, the crowned prince of the pine family. Not only by virtue of its unexcelled dimensions and the magnitude of its cones is it regal, but it is a most kingly monarch in its majestic, lofty bearing, its erect, self-asserting dignity, and its bowed head, obedient to its only masters—the powers above. Only the supreme emperor of the whole vegetable world, the immense *Sequoia*, also a denizen of our great Sierra forest, and admitting the sugar pine to fellowship, excels in dimensions (every way but in fruit) this noble, dominant tree of the whole Western world."

This tree is of interest to pharmacists because of the peculiar manna-like secretion which exudes scantily from the injured trees, hence the name, sugar pine.

The plate illustrations—seventeen in number—illustrate the principal characters distinguishing tribes, genera and species. They have mostly been taken from water-color paintings by Mrs. Lemmon.

The book is very readable, and should be in the possession of every one interested in the products of our Pacific Coast.

KURZES HANDBUCH DER KOHLENHYDRATE. Von Dr. B. Tollens. Zweiter Band (enthaltend die Forschungsergebnisse der Jahre 1888–1895). Breslau: Vorlag von Eduard Trewendt, 1895.

The short handbook of the carbohydrates, by Dr. Tollens, which appeared in 1888, was a reprint in book-form of the original article which he had contributed to Ladenburg's *Handwörterbuch der Chemie*, and was instantly

accepted as a most convenient and satisfactory reference book on this most important class of compounds. As the author says in the preface to this second volume, "the efforts of chemists to investigate more closely the nature of the carbohydrates have been extraordinarily numerous, and they have been followed by success in all respects." Especially does he refer in this statement to the remarkable work of Emil Fischer on synthetic formation of the sugars. Hence, material has accumulated in such amount as to make the present volume larger than the one issued in 1888. The theory of the carbohydrate groups, as developed and expanded by Emil Fischer in connection with his synthetic work, is first taken up and very satisfactorily stated; the newer methods for determination of molecular weight mentioned, and the results of their application to the sugars and starch, and the most recent results on the optical properties of the individual sugars, as well as their chemical reactions, are given.

The body of the book then takes up in detail the compounds belonging to the three great groups, monosaccharides, disaccharides and polysaccharides. The alcohols, like mannite, corresponding to the sugars and the acids derived from them by oxidation, are also considered in detail.

A very complete enumeration of journal references, covering thirty pages, and an excellent index, serve also to make the book one eminently useful to the student in this chemical field. We do not know of any book which will serve as an authority on this subject better than this new work of Prof. Tollens'.

S. P. S.

A MANUAL OF ORGANIC MATERIA MEDICA, being a guide to materia medica of the vegetable and animal kingdoms, for the use of students, druggists, pharmacists and physicians. By John M. Maisch, Ph.M., Phar.D., late Professor of Materia Medica and Botany in the Philadelphia College of Pharmacy. Sixth edition. Revised by Henry C. C. Maisch, Ph.G., Ph.D. Philadelphia: Lea Brothers & Company, 1895. Pp. 526.

The fifth edition of this work was revised by Professor Maisch a short time before the appearance of the recent revision of the United States Pharmacopœia. A number of additions and alterations have therefore been necessary, and this part of the work has been very creditably done by the reviser of the present edition. We cannot refrain, however, from expressing regret that photomicrographs have been employed for the new illustrations. Possibly the fault has been in the process of reproduction, but certain it is that they compare very unfavorably with the beautiful engravings which make up the greater number of the illustrations. If subsequent editions receive the same careful revision that has characterized the sixth, this work will stand as a lasting monument to the scientific and literary accuracy of the late Professor Maisch.

A LABORATORY MANUAL OF ORGANIC CHEMISTRY. By Dr. Lassar-Cohn, Professor of Chemistry in the University of Königsberg. Translated with the author's sanction from the second German edition, by Alexander Smith, Assistant Professor of General Chemistry in the University of Chicago. London and New York: Macmillan & Co. 1895. Price, $2.25. Received from John Wanamaker, Philadelphia.

In adding one more volume to the already long list of laboratory manuals, the author had in mind the practical side of the subject. We usually learn from the works on this subject that have previously appeared, the methods of prepa-

ration, the reactions involved and the properties and reactions of the product; but this work deals especially with the methods.

Part I treats of general methods, in which one chapter is devoted to each of the following subjects: Baths, Crystallization, Decolorizing of Liquids, Distillation, Drying Solids and Liquids, Extraction, Filtration, Determination of Melting Points, Determination of Molecular Weights, Sealed Tubes, Sublimation.

Part II treats of special methods, in which one chapter is devoted to each of the following subjects: Condensation, Preparation of Diazo Bodies, Preparation of Esters, Fusion with Caustic Alkalies, Preparation of Halogen Compounds, Oxidation, Reduction, Preparation of Salts, Saponification, Preparation of Sulphonic Acids, Remarks on Organic Analysis.

It is just such a book as every chemical student should be familiar with before commencing research work, and then he should have it within a convenient distance for reference.

BERICHT ÜBER DIE THÄTIGKEIT IM PHARMACEUTISCHEN INSTITUT, DER KAISERL. UNIVERSITÄT DORPAT IN DER ZEIT VOM 1. JANUAR, 1885, BIS 9. DECEMBER, 1894. Von Prof. Emer. Dr. G. Dragendorff. St. Petersburg, 1895.

In this JOURNAL, 1885, p. 318, is a review of a former publication of this kind, reporting the progress of the Pharmaceutical Institute of the University of Dorpat, under the direction of Professor Dragendorff, from 1865 to 1885. The present pamphlet of 23 pages continues that account down to the close of 1894, which was about the time he retired. It shows an increase in the attendance of students much greater than that of its predecessor. In 1885 the annual attendance of pharmaceutical and medical students amounted to 341, and in 1894, 634. During this time the number of pharmaceutical students has more than quadrupled, while the number of medical students has decreased somewhat. A concise account of the investigations conducted by the students is included, followed by a list of the dissertations and other publications.

JAHRESBERICHT ÜBER DIE FORTSCHRITTE AUF DEM GESAMMTGEBIETE DER AGRIKULTUR-CHEMIE. Neue Folge, 17, 1894. Edited by Dr. A. Hilger and Dr. Th. Dietrich, with the assistance of numerous collaborators. Berlin: Paul Parey. 1895.

This volume is up to the usual standard of excellence. It is especially complete on the subject of plant constituents.

ANNUAL OF THE UNIVERSAL MEDICAL SCIENCES. A yearly report of the progress of the general sanitary sciences throughout the world. Edited by Charles E. Sajous, M.D., and seventy associate editors. Illustrated with chromo-lithographs, engravings and maps. Five volumes. The F. A. Davis Company. Philadelphia, New York and Chicago.

The 1895 issue of this comprehensive work compares favorably with its predecessors. The articles contributed are by acknowledged specialists.

The following chapters in the several volumes are popular in character and would be found of interest by the general public as well as by the physician:

Vol. II. Inebriety, Morphinism and Kindred Diseases. By Norman Kerr, M.D.

Vol. III. Anæsthetics. By B. Dudley Buxton, M.D.

Vol. IV. Legal Medicine and Toxicology. By Frank Winthrop Draper, M.D. Bacteriology. By Harold C. Ernst, M.D.

Vol. V. General Therapeutics and Pharmaceutical Chemistry. By B. G. Dujardin-Beaumetz, M.D., and H. Dubief, M.D. Histology and Microscopical Technology. By Charles E. Sajous, M.D. There are numerous other excellent articles, but they are more technical in character.

HÆMATOBLASTS AND BLOOD PLATELETS. By Dr. M. L. Holbrook. Reprinted from the Proceedings of the American Microscopical Society. 1894.

ANALYSES OF CEREALS, collected at the World's Columbian Exposition. By Harvey W. Wiley. Bulletin No. 45, U. S. Department of Agriculture, Division of Chemistry. 1895.

THE PROCEEDINGS OF THE TWELFTH ANNUAL CONVENTION OF THE NATIONAL CONFECTIONERS' ASSOCIATION OF THE UNITED STATES, held at Saratoga, New York, July 9 and 10, 1895.

SOUTHERN JOURNAL OF PHARMACY AND MATERIA MEDICA.—This is the latest addition to the pharmaceutical press of the country. It is issued monthly, at Nashville, Tenn., and the first number presents a good, clean appearance. We are told "by way of preface," that "The primary object of this publication is to serve as a source of information regarding those subjects which are comprised in its peculiar field, and as a means of dissemination of ideas pertinent thereto; to act as a medium for the exchange of views among those interested, and to aid, so far as possibilities permit, in the improvement of pharmacy proper." The editor is Robert C. Bicknell, M.D., Ph.G., and the publisher, Franc. M. Paul.

CATALOGUES.

REGISTER OF ALUMNI AND ANNUAL ANNOUNCEMENT OF THE SCHOOL OF PHARMACY, UNIVERSITY OF MICHIGAN. Twenty-eighth year. Ann Arbor, 1895–96.

CHICAGO COLLEGE OF PHARMACY. Thirty-ninth announcement, 1895–96.

STATE UNIVERSITY OF IOWA, DEPARTMENT OF PHARMACY. Announcement for 1895–96.

UNIVERSITY OF KANSAS. Catalogue of the School of Pharmacy for 1894–95, and announcement for 1895–96.

TWENTY-FIFTH ANNUAL ANNOUNCEMENT OF THE LOUISVILLE COLLEGE OF PHARMACY. Session of 1895–96.

THE BROOKLYN COLLEGE OF PHARMACY. Fifth Annual Announcement, Session of 1895–96.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, October 15, 1895.

The first of the series of Pharmaceutical Meetings for 1895–96 was held in the Museum of the College. Mr. Joseph W. England presided, and the minutes of the last (June) meeting were adopted as reported in the July number of this JOURNAL.

The papers and talks, and the discussions which followed, were particularly interesting and instructive. The first paper on *Granulated Opium*, prepared by Messrs. Lyman F. Kebler and Chas. H. LaWall (see p. 554), was read by

the latter. Mr. England inquired how granulated opium is made, and Mr. LaWall, replying to this query, said that the process is a commercial one and more likely to be used by those handling large quantities of the drug, and that the product contains no diluent, whereupon he called attention to a sample which had been prepared by Mr. Kebler. Mr. George M. Beringer stated that the sample of granulated opium exhibited was very similar to the coarsely powdered opium that he had been using for several years for the preparation of camphorated tincture of opium, wine, etc. He had prepared the same by cutting the moist opium into small pieces and setting these aside in a warm place until sufficiently dry to powder. It was then coarsely powdered in a mortar and passed through a No. 20 or 30 sieve, until uniformly mixed. In the official process for tincture of opium, calcium phosphate and powdered opium (No. 80) are directed. He had frequently found the calcium phosphate of the market alkaline and at other times containing a large proportion of calcium carbonate. This admixture might possibly be the cause of the loss of morphine reported in the finished tincture. He saw no advantage in the use of the granulated opium in the preparation of the tincture, over the use of the gum opium. He recommended beating the gum opium, after being cut into small pieces, in a mortar with warm water until reduced to a uniform mixture, macerating with requisite amounts of alcohol and water, and percolating, the tincture to be assayed and standardized to a uniform percentage of morphine. Mr. LaWall further remarked that the calcium phosphate which he used in his experiments was not alkaline, and that he had made some experiments with talcum which gave practically the same results. He also stated that the large manufacturers assay the finished tincture. Mr. England showed a sample of moist Persian opium, which had been presented to the College by Mr. S. G. Rosengarten, and which assayed 15 per cent. of morphine, this high-grade opium being imported solely for the manufacture of the alkaloid. Mr. Kebler said that there must have been some mistake made in the abstract of Prof. Hemm's report on tincture opium, which appeared in the August number of the *National Druggist*, as Prof. Hemm, in a communication to him, had attributed the loss of alkaloid, reported by him, to be due to the method of percolation rather than to the mode of assay. Mr. England inquired of Mr. Kebler which method he used in estimating calcium meconate, whereupon the latter replied that he employed both the titration and the combustion methods.

Mr. England exhibited and described a new poison bottle, which was somewhat novel in design. The bottle has an aluminum screw top, the upper part of which is open for the insertion of a stopper, and on removing this it is found that another stopper is securely inserted, and that the most expeditious way of getting at the contents of the bottle is to unscrew the cap. Mr. England was of the opinion that this device could be regarded merely as an aid in securing the caution and care necessary in handling poisons.

The next paper, entitled *Additional Notes on Black Sulphur*, was read by Mr. Kebler, see p. 559.

Mr. Beringer referred to a new use for "Black Sulphur," and that was as an insecticide in the protection of trees, and he also stated that a company had been organized in the New England States to manufacture it for this purpose. The method of using it was to bore a hole into the tree and place therein some of the powder, afterward closing the opening. The State right for the sale of the

article in New Jersey had been purchased for $6,000, but the fraud has been detected, and this alleged compound will not attain the commercial importance its manufacturers had, no doubt, anticipated.

Mr. Beringer then gave a talk on the *Eucalyptus species*, referring more particularly to those grown in the United States. He said that this genus is the most distinctive of the natural order Myrtaceæ, to which it belongs. The leaves on the older plants vary in shape and size, and, like all the other members of that order, are characterized by an intra-marginal vein, and also by their pellucid-punctate appearance. The seed leaves are round, oval or cordate, opposite and horizontal, but, on development, becoming scythe- or scimeter-shaped and turned on edge so as to be vertical, and alternately arranged. The flowers are white, red or yellow, but never blue, and are peculiar in that the sepals unite to form a lid or operculum covering the stamens until the time of anthesis, when the lid drops off and the stamens appear more or less exserted. The shape of the lid is an important means of distinguishing the different species, as is also the surface where it is broken off. The shape of the calyx in bud and fruit and the venation and shape of the leaf are also very important means of distinguishing the species. These plants are indigenous to Australia and Tasmania, and the number of species is said to be about 140, with many varieties. Professor Bentham, who has made a study of them, considers the shape of the anthers and the manner of discharging the pollen two important characteristics. Baron Ferd. von Mueller has stated them to be the most difficult to study of any of the Australian plants, with the exception of the acacias, certain species of which yield the wattle barks. The trees are known by such vernacular names as gum tree, fever tree and stringy bark tree, iron bark, messmate, and the Eucalyptus gunnü as the cider tree. They are noted for their rapidity of growth as well as the height which they attain, the Eucalyptus amygdalina attaining a height of over 400 feet in their native country. There are 44 species now grown in the United States, at the California Forestry Station, at Santa Monica. Of these, specimens of 40 species had been obtained by Mr. Beringer, and were exhibited. These plants, produced from the seed, after seven years' growth, are developed so as to produce fruit. Several important products are yielded by these trees, namely, a kind of resin or kino used for tanning and coloring purposes, and the wood for carpentering and fuel. A company has been organized in California for the manufacture of the leaves into an extract as an anti incrustator for boilers. The oil is also obtained in this country by distillation, and the eucalyptol extracted by distillation or chemical means, the oil from Eucalyptus globulus yielding 75 per cent. of eucalyptol, and that from Eucalyptus amygdalina yielding phellandrine. The former alone should be used for medicinal purposes. The leaves of another species, Eucalyptus citriodora, develop, on drying, an odor resembling citronella, and would likely prove of commercial importance. The Eucalyptus globulus is utilized for planting around the orange groves in California to protect against winds, and now is the common kindling wood of the lower portion of that State.

Some plants not yet two years old were sent by Prof. Henry Trimble, and had been grown in a greenhouse in this city from seeds which he had procured from Baron von Mueller. They belonged to the species *macrocarpa*, and were quite healthy in appearance, and exhibited the leaf characteristics of the genus.

The Eucalyptus globulus is easily acclimated, and has attained in this country a height of from 50 to 70 feet in a few years. Mr. Evan T. Ellis wished to know their latitude of growth, upon which question Mr. Beringer remarked that they were quite easily acclimated, and that Eucalyptus alpina could probably be grown in the higher climates, and that different species could be adapted for different altitudes.

Mr. England said that he had heard it stated by physicians that the anti-malarial effects attributed to them were due to their power of absorbing moisture rather than to the emanations from them, to which opinion Mr. Beringer partly assented, believing that they acted in a dual capacity, and referred to the fact that in Italy these trees had been successfully used to reclaim large tracts of the most malarial marshes.

Prof. Edson S. Bastin described some plants which had been grown by Prof. Babcock at the Chicago Botanical Gardens, and remarked, in this connection, that the beneficial influence of these trees is due to the ozonizing effects of the oil, as is the case in pine districts, and that the statement of the quantity of water evaporated by them was probably exaggerated, and that they do not surpass, in this respect, other plants comparing with them in size.

Mr. Beringer spoke of the enormous underground development of some species, which would account for their absorption of water.

Prof. Bastin also referred to the intense heat and long seasons of drought in Australia as being causes which changed the shape of the leaves from their ancestral forms, as indicated by the younger leaves. Stomata exist on both sides of the leaves in equal number, and the vertical arrangement is probably due to the inherited result of heliotropism or the influence exerted by the sun.

Prof. Joseph P. Remington spoke of the rapid growth of some plants which were grown in Horticultural Hall after the Centennial Exposition in 1876.

After this discussion Mr. Kebler gave an abstracted report of *Assays of Coca Leaves* and experiments with the fluid extract of coca, which he had conducted. His paper, embodying a report of the work, is published in this number of the JOURNAL, page 572.

Mr. Kebler showed quite a number of samples of beeswax. One of these contained 90 per cent. of paraffin, another both rosin and paraffin, and one sample contained a substance which he, as yet, had not been able to identify. Mr. Kebler would be glad if any one having time for the work would undertake the investigation of this unknown substance and report upon it.

Mr. Ellis said that when he was in business in 1875, tallow was the only adulterant looked for, and was detected by simply chewing the wax.

On motion, adjourned.

THOS. S. WIEGAND,
Registrar.

The first shipment of *manganese ore* from Cuba to Philadelphia has recently been reported by Consul Hyatt, at Santiago de Cuba, to the Department of State at Washington. It will be a matter of interest to manufacturers of steel to know that this first shipment was made by the Pompo Mining Company, which has a capacity of 200 tons per day, but the demand for ore from this country is beyond their capacity to supply. The supply of this ore has heretofore come principally from the Black Sea region of Europe.

MINUTES OF MEETING OF MEMBERS OF THE COLLEGE.

SEPTEMBER 30, 1895.

The regular meeting of members of the College was held this day, Charles Bullock presiding. Twenty-five members were present. The minutes of last stated meeting were read and adopted. The minutes of meeting of Board of Trustees for September were read, and on motion approved. The Committee on Delinquent Members submitted the following report:

To the Philadelphia College of Pharmacy.

GENTLEMEN:—Your committee, appointed at the last meeting, to whom was referred the subject of delinquent members and of an associate membership, would report that these have been considered. Regarding the first matter, delinquents, we are not yet prepared to submit a final report.

The suggestion for the reintroduction of associate membership meets our approval, and we recommend that the by-laws of the College be amended to permit of this being effected. To meet this requirement we offer the following amendment: To substitute for Chapter VIII, Article V, of the by-laws, the following:

Article V. Any graduate of a pharmaceutical college, chemist, apothecary or manufacturer residing in the United States and conforming in his professional conduct to the code of ethics adopted by this College, may be elected as an associate member.

Associate members shall each pay a contribution of $3 annually in advance. They shall be permitted to use the reading room and library, subject to such rules and regulations as the Library Committee may adopt, and to have access to the museum and collections, and to participate in the scientific meetings and work of the College, and receive such publications of the College as are distributed to members; but they shall have no right to vote or hold office.

Any associate member may, upon written request and nomination, be elected to active membership when his associate relation shall terminate, and upon the return of his certificate of associate membership, he shall receive a certificate as an active member.

GEORGE M. BERINGER,
WM. E. KREWSON,
WILLIAM B. THOMPSON.

On motion, the report was accepted and the recommendation to amend Chapter VIII, Article V, of the by-laws, by the substitution of the above article, was directed to lie over, under the rules, until the next meeting of the College, to be then taken up for final consideration. The report of delegates of the College to the sessions of the American Pharmaceutical Association, held at Denver, in August last, was presented by Prof. Remington.

On motion to proceed to election of trustees for three years (three) and (one) for the unexpired term of Edward C. Jones, deceased, tellers reported the unanimous re-election of Howard B. French, E. M. Boring and Alonzo Robbins, and for the unexpired term, Mahlon N. Kline. Prof. Trimble submitted a list of candidates for the positions of honorary and corresponding members, which was directed to be referred to the Board of Trustees for action.

On motion, meeting adjourned.

WILLIAM B. THOMPSON, *Secretary.*